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Research Paper

Urinary Tract Infection: Invitro efficacy of Physiologic Saline 0.9%, Acetic Acid 0.25% and Metronidazole 500 Mg among Patients with Indwelling Catheter in Selected Governmentt Hospitals, East Amhara, Ethiopia

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ABSTRACT
Background: *Urinary tract infection (UTI) is the most common non-intestinal infection worldwide. In the developed world, the incidence and prevalence of UTI would be similar owing to the relatively short duration of illness experienced by the patient with set access to healthcare services. Urinary tract infections are the most common type of Health Care-Associated Infections (HCAIs) and account for almost 40% of them.* ***Objective:*** *To assess the magnitude of UTI and compare the in-vitro efficacy of Physiologic Saline % 0.9, acetic acid 0.25%, and Metronidazole 500mg in preventing growth of UTIs causing agents among patients with an indwelling urinary catheter in Government Hospitals, East Amhara, Ethiopia from November 2019 to January 2020.* ***Methodology:*** *A total of 185 samples were selected by consecutive sampling technique. An experimental research design was employed. Both descriptive and inferential statistics were used to analyze the results. Urine microscopy, chemical test, and culture were done to identify UTI-causing agents, and the three solutions were tested for their efficacy in preventing the growth of those agents.* ***Results:*** *The prevalence of UTI found to be 41.08% and common UTIs causing agents found were E. coli, Citrobacter, Klebsiella rhinoscleromatis, Providencia rettegri, P.mirabilis, Enterobacter, S.epidermides, Klebsiella pneumonia, S.aures, and Pseudomonas aeruginosa. Regarding the efficacy, a very small proportion of bacteria were found to be sensitive for specific solutions; metronidazole 500 mg solutions were effective in preventing the growth of Citrobacter, and acetic acid 0.25% solution was effective in preventing the growth of S.epidermides.* ***Conclusion and Recommendation:*** *It is concluded that the prevalence of urinary tract infection was noticeably higher. Recommends that, further researches could be conducted using different drugs or chemicals to assess the efficacy with a large number at different sites and introduction of bladder wash/irrigation by professional training to the clinical staff.*

KEYWORDS: *Efficacy, Physiologic Saline, Acetic acid 0.25%, Metronidazole 500 mg, Indwelling Catheter*

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I. INTRODUCTION

The urinary tract infection (UTI) is a common contagion among men and women but the incidence is quite high among women due to their physiology and the most common form of bacterial infection [1]. It can be a consequence of poor diagnosis and is regarded as a common hospital-acquired infection [2, 3]. The presence of bacteria in the bladder, a normally sterile site, triggers an inflammatory response [4]. World Health Organization report 2016 says UTI is one of the public health issues and needs to be treated with different interventions. According to American Urology Association 2016, UTI is a significant health problem in both community and hospital-based settings. It is estimated that 150 million UTIs occur yearly worldwide. Between 15% and 25% of hospitalized patients may receive short-term indwelling urinary catheters [5]. Urinary tract infection is one of the most common hospital-acquired infections; 70%–80% of these infections are attributable to an indwelling urethral catheter [6]. Microbial pathogens can enter the urinary tract either by the extraluminal route, via migration along the outside of the catheter in the periurethral mucous sheath, or by the intraluminal

route, via movement along the internal lumen of the catheter from a contaminated collection bag or catheter drainage tube junction [7].

A study conducted in the US identified gender as an important risk factor for the development of certain HCAIs and there is strong evidence of an increased risk of Catheter Associated Urinary Tract Infection (CAUTI) in females, attributable to anatomic differences that result in a greater propensity for bacterial contamination of the catheter [8,9]. Surveillance programs that monitor urine cultures through the review of microbiology laboratory results are generally used to detect patients with potential UTIs. Patients with positive urine culture results are then evaluated for the presence of an indwelling urinary catheter and a CAUTI defined by using surveillance criteria [10]. A study highly recommends a trial of urinary installations and irrigation in reducing UTIs [11].

II. OBJECTIVES

1. To find out the magnitude of urinary tract infection among patient with the indwelling catheter in Government hospitals, East Amhara, Ethiopia, November 2019 to January 2020
2. To assess the in-vitro efficacy of physiologic saline 0.9%, acetic acid 0.25%, and metronidazole 500 mg in preventing UTIs causing agents among patients with the indwelling catheter in Government hospitals, East Amhara, Ethiopia, November 2019 to January 2020.

III. MATERIALS AND METHOD

Study area, design, and period: The institutional-based experimental design was used to conduct the study in Dessie Comprehensive Specialized Hospital and Borumeda Hospital from November 2019 to January 2020.
Source population: The patients who are hospitalized and with an indwelling catheter.
Study population: Hospitalized patients with an indwelling catheter for at least two days during data collection time.
Inclusion criteria: Patients with indwelling catheter for at least 2 and more days.
Exclusion criteria: The patients who are suffering from renal diseases, the pediatric population, pregnancy and who are suffering from severe mental illness.
Dependent variables: Urinary Tract Infection and in-vitro efficacy of solutions i.e., Physiologic Saline 0.9%, acetic acid 0.25%, and Metronidazole 500 Mg.
Sample size and technique: A consecutive sampling technique was used to select 185 patients having an indwelling catheter.
Sample Collection, Handling & Transport:
Ten ml urine specimen was collected from each study participants, kept in ice box and then transported to Wollo University Microbiology Laboratory within two hours for processing. When a delay of more than 2 hours was anticipated, urine specimens were kept refrigerating at 4° C until they had been processed.
Data collection and analysis: The data were collected by trained professionals and under the supervision of the investigators. Urine specimens were collected in sterile urine sample containers with code and proper labeling. The urine specimen was collected by clamping the tubing below the collection port. The catheter was clamped for 20 to 30 minutes until at least 5 to 10 mL of urine collected. The catheter was then unclamped and urine was allowed to flow into a sterile plastic container. The Data were entered edited, stripped, coded, and entered twice, and analyzed by SPSS version 25. The processed data were presented by descriptive statistics to show the magnitude and in-vitro efficacy by using frequencies and percentages. Ethical clearance was obtained from the Institutional review board of the College of Medicine and Health Sciences, Wollo University. Then, permission was secured from the concerned administrative authority of selected hospitals to communicate with relevant bodies at the hospital. Informed consent was taken from the samples before the data collection and anonymity and confidentiality were maintained.

IV. RESULTS

In this study the in-vitro efficacy of physiologic saline 0.9%, acetic acid 0.25%, and Metronidazole 500 mg solutions in preventing the growth of UTI causing agents was assessed following determination of the magnitude of urinary tract infection and identifying common UTIs causing agents. One hundred eighty-five urine samples were taken following the standard of practice of collecting a urine specimen. Urine microscopy, chemical test, and culture were done to identify UTI-causing agents, and the three solutions were tested for efficacy in preventing the growth of those agents.

The magnitude of UTI in this study was found to be 41.08% and common UTIs causing agents were E. Coli, Citrobacter, Klebsiella .R, Providencia rettegri, P.mirabilis, Enterobacter, S.epidermides, Klebsiella pneumonia, S.aures and Pseudomonas aeruginosa.

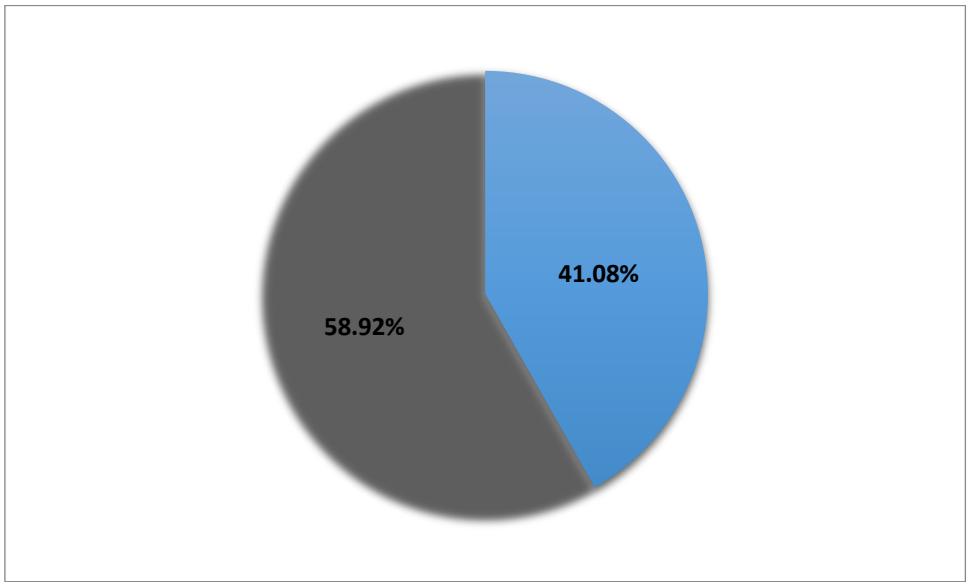

Figure 1: Blue color denotes the magnitude of urinary tract infection among patients with the indwelling catheter in selected government hospitals in East Amhara, Ethiopia

Regarding the efficacy of the above three solutions, only diminutive proportion of bacteria were found to be sensitive for specific solutions; metronidazole 500mg solutions were effective in preventing the growth of Citrobacter, and acetic acid 0.25% solution was effective in preventing the growth of S.epidermides.

Table 1. Common urinary tract infection causing agents and in-vitro sensitivity of physiologic saline, acetic acid 0.25% and metronidazole 500mg solutions in preventing the growth of agents, 2020.

Sl. No	Number of Urine Sample	Culture Results	Isolated Bacteria	Efficacy Test		
				Physiologic Saline 0.9%	Acetic Acid 0.25%	Metronidazole 500mg Solution
1.	7	Positive	Enerobactor	Resistance	Resistance	Resistance
2.	8	Positive	Citrobacter	Resistance	Resistance	**Sensitive**
3.	19	Positive	E.coli	Resistance	Resistance	Resistance
4.	9	Positive	Klebcella rhinoscleromatis	Resistance	Resistance	Resistance
5.	6	Positive	Providencia rettegri	Resistance	Resistance	Resistance
6.	3	Positive	P.mirabilis	Resistance	Resistance	Resistance
7.	5	Positive	S.epidermides	Resistance	**Sensitive**	Resistance
8.	6	Positive	S.aures	Resistance	Resistance	Resistance
9.	2	Positive	Klebsiella pneumonia	Resistance	Resistance	Resistance
10.	11	Positive	Pseudomonas aeruginosa	Resistance	Resistance	Resistance

V. DISCUSSION

Urinary tract infection (UTI) is one of the most common hospital-acquired infections; 70%–80% of these infections are attributable to an indwelling urethral catheter [10]. Another study also reaffirms that among UTIs acquired in the hospital, approximately 75% are associated with a urinary catheter, which is a tube inserted into the bladder through the urethra to drain urine [12]. In line with these studies, the prevalence of UTIs in this study was consistently higher (41.08%) among patients with an indwelling catheter. One previous study revealed that urinary tract infections (UTIs) are a severe public health problem and are caused by a range of pathogens, but most commonly by Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Enterococcus faecalis and Staphylococcus saprophyticus [13]. Consistent with the above study, almost all similar agents were identified in our study. In this study, the in-vitro efficacy outcome stands unique and the new insightful domains so; it is in an enviable position since there is no existing relevant literature with our search.

VI. CONCLUSION AND RECOMMENDATION

In this study, the magnitude of UTI is higher among patients with an indwelling catheter. It is necessary to further investigate what reasons contribute most for it side by side to using proven methods of prevention like closed catheter drainage in patients with an indwelling catheter and strengthening the use of clean intermittent catheterization (CIC) over other methods of bladder management. Further researches could be conducted using different drugs or chemicals/solutions to assess the efficacy

Conflict of Interest: All the authors declare that there is no conflict of interest.

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